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ORIGINAL ARTICLES.

A MICROSCOPIC STUDY OF THE CONJUNCTIVAL
VESSELS.*

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REPORT ON A SERIES OF SEVEN HUNDRED EXAMINATIONS.

The transparency of certain ocular tissues permits their direct examination with the aid of a microscope while still intact, without waiting for stained sections.

Such examinations require instruments especially constructed for the purpose to secure the best results. In the Zeiss Binocular Corneal Microscope we possess an instrument better adapted for these studies than any previously devised. For a detailed description of it we must refer to previous publications. It secures depth perception, in addition to any desirable magnification, provided the observer is capable of binocular vision. A substitute may be devised by using the tube of an ordinary microscope and illumination supplied by a pocket flashlight. The appearance of tissue is different when examined with the naked eye or with a microscope during life, or in a thin section after hardening, staining, and mounting. Each method has its particular advantage.

The location and extent of lesions and of foreign bodies, etc., in the anterior segment of the globe can usually be detected with ordinary visual acuity, aided sometimes by a simple loupe, as well as with any stronger microscope, for the reason that the increase in the size of the picture with the microscope does not make up for the decrease in the size of the field. However,

*Read before the St. Louis Medical Society, April 19, 1913.

there are small but very significant lesions due to injury or disease which can best be studied under the highest available magnifying power. To a novice the appearance of the tissue thus enlarged may be confusing, but after a little experience no other method of examination can be so perfectly satisfactory.

The tissues of the eye have long been used for the study of vascular conditions. In 1851 Helmholtz invented the ophthalmoscope, making possible the direct examination of the retinal vessels. The study of vascular phenomena in the retina has continued unabated ever since. Coccius, a year later (1852), demonstrated the conjunctival circulation microscopically. So little attention was given to further studies of the conjunctival vessels or their circulation that several later observers re-discovered this phenomenon independently.

After the demonstration of the conjunctival circulation was made here three years ago, before the Medical Society of the City Hospital Alumni, it was repeated on account of its novelty before several scientific societies in this city and at the physiological laboratory of Chicago University.

Microphotographs of the ocular tissues during life have been made with the binocular microscope by the aid of a strong arc lamp. My own attempts with illumination less trying to the patient have been rather unsuccessful. The length of exposures, even with the most rapid plates, is such that imperceptible movements of the eye are bound to blur details of the negative.

The fact that the movements of the blood corpuscles can be followed proves the possibility of studying minute tissue changes with the binocular microscope. The study of the circulatory movements in the conjunctival vessels is exceedingly fascinating. In the general character of the conjunctival vascular supply we have the greatest similarity to the general vascular supply of the body—skin, muscles, etc. We see here vessels which anastomose freely, which are stretched, shifted, or thrown into folds by the ocular movements, which are exposed to the extremes of outside temperature and are affected by local irritation or pressure. They are more nearly representative of the general circulatory system than the other ocular vessels. The retinal vessels do not anastomose, resembling rather those of the brain, while the choroidal vessels are fixed in their position in the tissues and are but little disturbed by mechanical or other outside influences.

That treatises on diseases of the general vascular system have

ignored the possibilities of studies on the conjunctival vessels is apparent in the following quotation concerning the flow of the blood from such a volume published only last year:

"The farther away from the heart the measurements are made the more even the flow. In the capillaries it is quite steady, as any one can prove by direct examination of the web of a frog's foot or the cat's mesentery. The rate in man is estimated to be between 0.5 and 0.9 mm. per second."

Observations on the circulation in the "web of the frog's foot" or in the mesentery of the cat traumatically irritated, can hardly be as typical for the movements of the blood stream in human capillaries as are the observations made on the capillaries in the conjunctiva under normal conditions. As a matter of fact the findings on direct examination of the corpuscular movements in the human conjunctiva do not agree with the above statement.

For example, we find that the rate varies in the different arterioles, capillaries, and veins from a barely perceptible motion to a little more than 1 mm. per second. Local irritation engorges the vessels and changes the rate. Further, some parts of the capillary network are ordinarily supplied with blood elements *only* occasionally. This is shown by the passage of a column of corpuscles along a certain line, followed after an interval of several seconds during which no corpuscles pass, by another column in the same line as before. All of which proves that the flow in the human capillaries is less "steady" than was supposed by the author of that volume.

Even a regurgitation of blood in the capillaries and smaller vessels has been noted. The flow is sometimes almost equally divided between the two directions, raising the question if it has a fixed direction. In my previous publications attention has been called to this phenomenon of regurgitant capillary flow with the endeavor to explain its presence by low blood pressure, vaso-motor disturbances, or general fatigue.

Capillary regurgitation is present where an aortic lesion is marked; however, the cases referred to above showed *no cardiac* lesions on special examination. Recently we found this capillary regurgitation in a man aged 25 years suffering from hyperthyroidism. His blood pressure was 160. He likewise showed early vascular changes producing obstruction in the capillaries, to which we shall refer later. As we have previously demonstrated capillary regurgitation after syncope, it may be that some con-

nexion exists between the regurgitation in the capillaries and the weakness and exhaustion of which this patient complained.

With the aid of the ocular micrometer and a stop watch, the rate of the capillary flow can be rather accurately measured. As a suggestion for further study in this line, consider the advantage of recording the exact effect of cardiac stimulants, etc., upon the capillary flow. For, to obtain a perfectly balanced circulation, cardiac compensation should go hand in hand with the freest possible capillary flow. A series of cases thus followed, selecting several conjunctival vessels, arterioles, capillaries and veins, and, after carefully noting the flow and the distention of the vessel, repeating these measurements after the administration of various circulatory stimulants, might add some facts worth knowing to our general fund of information concerning these drugs.



FIG. 1. Sketch showing Conjunctival Vein of man aged 30, suffering from Exophthalmic Goitre. Micro-photographs were not successful. (Drawn by Dr. F. O. Schwartz.)

But it is not the purpose of this paper to deal so much with the circulatory phenomena as with the manifestations of changes in the blood vessels themselves.

The first series of examinations to determine the presence of changes in the conjunctival vessels was made three years ago at the request of Dr. W. W. Graves in connection with his studies on the "Clinical Significance of the Scaphoid Scapula." No exact description of the changes to be expected in vascular disease in these vessels was at hand to guide us, but certain appearances showed clearly a departure from the normal.

Sacular or fusiform dilatations in the lumen of small arterioles, veins or capillaries are no more normal there than in the larger vessels where they are subject to macroscopic demonstration. The conjunctival vessels are normally tortuous to permit their adaptation to the extreme movements of the eyeball. But it is not normal to find sharp angles in the course of a vessel, instead of the usual undulating tortuosity. The lumen of normal healthy

blood vessels shows no abrupt break in size and shape except as due to branches. When the lumen as outlined by the blood contents suggests a string of beads or becomes "crinkled" like a thin celloidin section, passed into oil without dehydration, we are as certain to find pathological processes in the vessel wall as if we had a hardened artery under our finger. It is not within the scope of this paper to discuss the various views of investigators concerning the exact beginning or the progress of arteriosclerosis (better angiosclerosis) from a histological standpoint. It seems to be accepted that no important changes occur in the wall of a blood vessel that do not show themselves earliest in

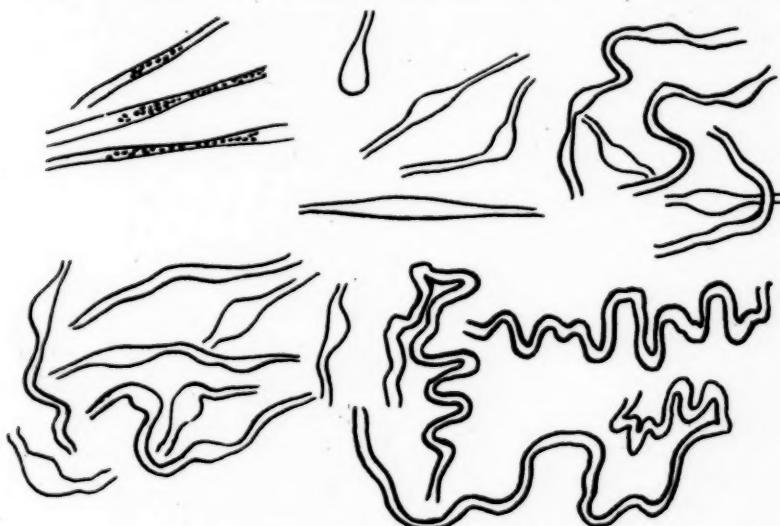


FIG. 2. Rough Diagrammatic Sketch showing the various Stages of Vascular Changes as observed in the Conjunctival Vessels. Encroachment on lumen of capillaries (upper left hand), then capillary aneurisms, finally marked varicosities and irregular tortuosity in larger vessels (lower right hand). Drawn by Dr. F. O. Schwartz.

their effect on its lumen as obstruction or dilatation or both. Experience has shown how difficult it is to recognize these early changes in the caliber of vessels from the examination of cross sections under the microscope. Unless each section is an exact cross-section at right angles to the axis of the vessel—a variation in caliber proves nothing. It may be a real narrowing or dilatation, or it may be a section cut slantingly which shows an apparently larger area.

This was easily tested by securing pieces of conjunctiva (for which I am indebted to Dr. D. L. Harris, city pathologist,)

imbedding them in paraffin and then cutting them in a series. Following a small artery through twenty consecutive sections, averaging 7 micron each in thickness, its maximum diameter varied from 29 to 46 micron while its transverse diameter varied from 11 to 22 micron. In the same way the maximum diameter of a vein varied from 44 to 133 micron, while its transverse diameter varied from 9 to 37 micron. These variations occurred without the presence of any evidence of vascular disease.

It is obviously out of the question to get serial sections of these smaller branches in which the errors arising from change of this relation between the axis of the vessel and the plane of the section can be eliminated. Histological examinations are thus inadequate to study the earliest stage of angiosclerosis.

To learn more about the frequency and significance of the presence of the dilatations in the conjunctival vessels above noted a large number of individuals had to be examined.

Through the courtesy of Major D. C. Howard, U. S. Army, it was possible to make these examinations at Jefferson Barracks. The men examined were with few exceptions those who had passed the rigorous physical examination which precedes actual enlistment and were found free from physical defects or the active manifestations of any disease. The examination was not extended beyond a search for the presence of aneurysmal dilatations in the conjunctival or episcleral vessels. Both eyes were examined. Only the cases which clearly showed these irregularities were designated "positive".

Colored men among the troops proved quite unsatisfactory for these studies. The amount of pigment they have in the conjunctival and subconjunctival tissues usually hides the finer divisions of the vascular system from inspection. As is readily noticed on close inspection, the "whites" of negroes' eyes look so strikingly white only from contrast with the dark iris and skin. As a matter of fact there is considerable pigment in the scleral conjunctiva of colored people.

The absence of dilatations does not exclude all varieties of vascular disease as we shall find later, but their presence was the basis for classification in the first and larger series. Of the 625 men whose examinations were recorded, 139 or 22.2 per cent. showed "positive" findings.

The average age of the "positive" cases was 23.82 years, while that of the "negative" ones was 21.73. This finding is in accord

with what might be expected. The older the men the greater is the likelihood of vascular changes. As the men examined were so nearly of the same age, we could not expect a very great difference in the ages of the two classes.

In a group of men all of whom had been selected for the army on account of good physique and robust health it is difficult to select certain physical signs as significant of the advantage of the one class over the other. Jefferson Barracks receives recruits, keeps them a short period for preliminary training, and then sends them to all parts of the globe, wherever the U. S. Army has need for them. Therefore it was not possible to make extensive records of the health or sickness of the members of these groups for comparison. Even had it been possible, the short period of a three year enlistment could hardly reveal conclusively the physical superiority of one over the other at their age.

For further data we then turned to the measurements made of the height, weight, and chest expansion at enlistment. As might be expected the group that averaged more than two years older, that is the one with positive findings, also showed greater weight. The average weight was 146.25 pounds for the "positive" and 140.90 pounds for the "negative".

The average height was 68.21 inches for the "positive" group and 67.03 for the "negative" group. We must remember that a majority of these men were 18 to 22 years of age. An increase of $1\frac{1}{4}$ inches in height; and of $5\frac{1}{3}$ pounds in weight is a natural phenomenon in the 2.1 years which separated the average man in the two classes.

Therefore, the apparent better showing of the men with positive finding comes to naught. But there is another factor which, in my opinion, tends to show that the group of "negatives" really embraces the better men physically.

The chest expansion in the "negatives" was one point better than that of the "positives", in spite of the fact that the latter had greater height and weight.

There was available also a hospital record, during their stay at Jefferson Barracks, for 22 men in the "positive" group. Of these all but three left the post in the course of three or four months so that this record is of little value as proof, but it is rather suggestive. Nine of the twenty-two suffered venereal diseases in some form as follows:

Gonorrhœa	4
Gonorrhœal Arthritis	2
Syphilis (tertiary)	1
Chancroids and Bubo	1
Prostatic Abscess	1

One case had enterocolitis, marked arterio-sclerosis, and premature senility (aged 53), and was discharged for disability. One case of acute rheumatism and two cases of tonsillitis, make a total of 13 cases out of the 22 in which we might expect to find such evidences of vascular disease as were present in the positive group.

Considering the entire series, it seems that these changes in the conjunctival vessels are no more abundant (22%) than might easily be accounted for by vascular diseases through inherited or acquired syphilis, rheumatism, autointoxication, etc.

The next step was to examine the victims of a disease known to produce vascular changes. For that purpose cases were selected in whom the diagnosis of syphilis was positive clinically and usually by Wassermann tests as well. It was proposed to study the extent of these changes in the conjunctival vessels in the different stages of the disease to discover, if possible, a relation between them. The classification of the findings had to be made without precedent. No previous system was available for comparison.

The last series of cases was begun after the first examinations at Jefferson Barracks had been concluded. It is also entirely independent of the series examined with Dr. Graves three years ago in which were many syphilitics and heredo-syphilitics. Nor does it include numerous examinations made in private practice during the last three years in which the constancy of lesions in the conjunctival vessels in syphilitic cases had attracted attention.

Again I am indebted to Major Howard and Capt. Pillsbury for the privilege of examining the cases in their special syphilitic clinic. Also I am obliged to members of the visiting and resident staff of the City Hospital for similar opportunities, and to Dr. Engman for the cases examined at the Barnard Skin and Cancer Hospital.

The first and most striking observation was that more or less pronounced changes of the types above described as pathological were demonstrable in each case except two, to which I shall refer

later. In fact most of them were demonstrated to physicians present when these tests were made at the various hospitals. The appearances were noted in each case according to the abundance of aneurysmal dilatations and their type, also of the size of blood-vessels involved. The findings were then charted, recording age, duration of disease, etc.

If a clear history of the several stages of lues could be obtained it was noted in the respective column. The last three columns contain the results of Wassermann tests in cases where it had been made, notation of the presence of aneurysmal dilatations in the conjunctival vessels, and special items. The simple presence of dilated capillaries in the ocular conjunctiva was indicated by a plus sign. Their abundance was indicated by a double plus sign and their rarity by a plus sign followed by a minus sign.

This table furnished the first revelation that these are not haphazard appearances, but that they have rather definite relations to the severity and duration of the diseases. So definite, in fact, that at the City Hospital we began at last to estimate the duration of the disease from the conjunctival picture with surprising accuracy. However, it is not a method so definite that sole reliance could be placed on it for that purpose. We succeeded by charting these findings in bringing some order out of the chaos of nearly a thousand previous observations.

Neglecting the factor of age and other diseases we made comparisons, and found the average duration of the disease in groups classified according to the abundance and kind of vascular change noted.

We excluded hereditary cases because "duration" in these cases is not comparable with "duration" in acquired lues. Another case was omitted from the calculations because trachoma existing for many years had so altered the conjunctival tissues that it seemed improper to consider it with the rest.

In the first group were two young men (cases No. 26 and No. 40), with unmistakable chancre, who had come into the hospital at once. Their conjunctival vessels examined at the end of three weeks in the one and one month in the other showed nothing pathological. These are the only cases in the entire series in which the conjunctiva showed no vascular change. No small significance attaches to the fact, that these were *young* men and that the infection was *very recent*.

The second group contains the cases which showed few capil-

lary dilatations and almost no other evidence of vascular disease. The average duration of the disease was found to be $3\frac{1}{4}$ months for this group, with a maximum of 8 months and a minimum of 1 month.

A case in the second group deserves our special attention. A recruit, aged 22, who had deserted, when caught and returned to the Barracks, was found to have a fresh chancre. The Wassermann test was negative, but the spirochete pallida was demonstrated in the lesion. Beginning obstruction in some of the finer capillaries was here demonstrated, of such a nature that it may readily explain the early capillary aneurysms.

The obstruction in these capillaries may be a slight swelling of the retina or may be due to the actual presence of spirochete. The effect of such an obstruction is the bulging of the healthy capillary wall on the proximal side of the lesion. In capillaries such a change can occur quickly. If, due to thickening of the intima, the obstruction gradually becomes complete we may expect the formation of a sacular aneurysm.

Under other conditions, various types may develop. Sometimes the flow of blood is not entirely stopped and a fusiform aneurysm results. Often we were able to trace the flow of corpuscles through the dilatation, proving conclusively that they are integral parts of the blood supply of the conjunctiva.

This explanation of the formation of the dilatations was advanced first at our demonstration of the conjunctival circulation, in 1910. Similar observations have been made upon the retina and are recorded by the late Dr. Edw. L. Oatman, of New York, in a most excellent article on "Arteriosclerosis of the Retinal Vessels", in *Ophthalmology*, July, 1912, as follows:

"Miliary aneurysms form on the small arterioles and capillaries. In the larger vessels, aneurysms and varicosities occur where the walls are least affected. Frequently, they form immediately behind a rigid constriction which acts as a dam to the blood current. Retinal aneurysms seldom attain a large size owing to the compression exerted upon the vessels by intraocular pressure."

The perivascular tissue offers some restraint to the growth of miliary aneurysms. Their thin cellular wall is probably ruptured before they get to be more than eight or ten times the diameter of the vessels from which they originate. Even then, if springing from capillaries, they are too small for recognition with the naked eye.

In one case among the soldiers in the first series examined at Jefferson Barracks, the recent rupture was easily demonstrated to the medical officers present. Other unruptured aneurysms were also present in the same individual.

A change of position of the eye, through torsion of the vessels, rubbing the eye, or even the pressure of the eyelid in closing may be sufficient to rupture one of these aneurysms. Thus, we can account for the not infrequent occurrence of spontaneous subconjunctival haemorrhage.

That this destruction of these miliary aneurysms does take place is further apparent from a consideration of the remaining groups. There were two groups of cases showing but few aneurysms in the conjunctiva. One was the group we have just considered, in which the luetic infection was quite recent, the other was made up of cases of long standing lues.

The difference between the two classes was that in the first we had few capillary aneurysms *without* changes in the larger vessels, while in the latter we had a few capillary aneurysms with *marked* changes in the larger vessels such as "beading"—"crinkling" thickened walls, shown by dense white streaks accompanying the blood column, sharp angles instead of the usual tortuosity, etc.

In cases of the latter class, we found capillaries, shut off at both ends, with an immobile column of corpuscles distinctly in single file, but no longer of normal color. Their brownish tint showed that after being trapped in the capillary as its lumen closed their haemoglobin had been reduced. Their position remained unchanged for the period during which these cases could be watched. The average duration of syphilis in the cases which manifested these later stages of vascular disease in the conjunctival vessels was 13.5 years.

In a case of long standing lues examined at the City Hospital, showing the destructive lesions of the tertiary stage, we were much impressed by the *whiteness* of the inter-vascular spaces. It was explained by the partial absence of capillaries and consequent lessening of capillary circulation. What we saw was white bloodless sclera. Scarcely any miliary aneurysms could be demonstrated, but the lumen of all vessels was irregular as in the later stages of vascular deterioration.

Secondary changes, which destroy these aneurysms, reduce the capillary circulation, thus lessening the nutrition and vitality of the tissue involved. Thus we can account for the "pallor" in old

syphilitics where the haemoglobin index remains normal, on which Graves lays special stress in his recent article on the "Clinical Recognition of Syphilites".

The rupture of capillary aneurysms and the deposit of blood pigment in the inter-vascular spaces, which we may assume occurs unnoticed in the skin as well as in the conjunctiva where we could see it, accounts in part for the pigmentation of the skin in syphilitics, referred to by the same author.

If we consider these processes, observed in the conjunctiva, as happening in other organs of the body, and in the brain and spinal cord, we are enabled to account for many degenerative changes noted in the later stages of syphilis and in old persons suffering from angiosclerosis.

That section of our series of syphilitic cases in which aneurysmal dilatations were marked, was divided into two groups. The first group with a moderate number showed an average duration of syphilitic disease of 6.4 years, while the second group in which these dilatations were abundant showed an average duration of 4 years. All pointing to the presence of capillary aneurysms at rather an early stage of the vascular disease which follows syphilitic infection.

Whether this is true of all infectious diseases affecting the vascular system cannot be determined from the evidence at hand. But there seems to be no valid reason why other infections, measles, scarlet fever, etc., even malaria and grippe should not produce similar changes.

The classification of the findings in hereditary lues is more difficult than in acquired lues. That vascular changes are apparent at an early age was shown in the series examined with Dr. W. W. Graves, to which he refers in his first article on "The Scaphoid Scapula". While there was frequently marked "crinkling" or "beading" of some of the vessels, we did not as a rule find the capillary dilatations (miliary aneurysms) so characteristic of the earlier stages of acquired lues. Until the examination of a larger series of young children has been completed we can only speculate on the reasons for their absence. It may be that the capillary circulation is involved very early, even during intrauterine life.

Though we have succeeded in classifying our cases in this manner, we must remember that what we see in this series is the result of syphilis, plus heredity, plus age, plus all other fevers, infectious diseases, intoxications, organic and inorganic poisons,

plus exposure, plus worry, plus work, etc., including the whole category of harmful influences as well as the regular wear and tear in the process of living.

The figures in another series would probably show wide variations from our present table, but the general findings should be similar. On account of the universal prevalence of these diseases, the labor of measuring the effect of any one on the vascular system is despairingly difficult.

Study of the retinal and conjunctival vessels in health and disease has furnished a large share of the information we possess. The comparative value of the two methods in the early discovery of vascular changes will be clearer after referring to this report of a "classical case" in Oatman's article which, he says, "exhibited all the fundus changes that belong to the early stages of diffuse arteriosclerosis."

"Boy, 15 years of age, sought medical advice because of recurring epistaxis. Incidental examination of the fundus oculi at once revealed the probable cause of haemorrhage. The arteries were moderately dilated and more tortuous than the veins. Small vascular twigs were unusually numerous and distinct. With a weak illumination the walls of the arteries were seen as faint lines bordering the blood columns. The central light streak on the arteries was unusually bright and sharply defined. There was a strong locomotion pulse, especially marked wherever an artery made a sharp bend. The veins appeared of normal size and not unduly tortuous. There was a strong, negative venous pulse confined to the disc. The disc itself was uniformly reddened. Urine contained albumin and hyaline casts. Heart moderately dilated. Surface blood pressure was 120 mm. Hg."

Notice that the description of the retinal appearance is made up largely of relative terms, such as "small"—"more"—"moderately"—"unusually bright" and others. The value of such a description depends entirely on the interpretation and the mental attitude and experience of the observer.

The direct unequivocal statements aside from the urinalysis and blood pressure pertain to arterial and venous pulsation. Pulsation is or is not present, but in another part of the article Oatman states that Raehlmann's opinion that venous pulsation is a "nearly constant symptom of arteriosclerosis" in the retinal vessels may be questioned.

In the later stages of arteriosclerosis the retinal appearances are quite positive, but even then do not permit an independent

and conclusive prognosis concerning the general health of the individual.

On the other hand, the changes in the conjunctival vessels are demonstrable as soon as their lumen is encroached upon, making it possible to discover the first symptoms of vascular disease. Furthermore these signs are so clear and definite that they can be recognized unhesitatingly by any careful observer.

Evidence obtained from any ocular symptom of arteriosclerosis is only of relative and corroborative importance. Nevertheless, no clinician can afford to overlook what might be learned by a careful study of ocular conditions including microscopic investigation of the conjunctival vessels in any case of vascular disease.

Especially is this true in those cases where the onset is stealthy and obscure and where an analysis of the general findings and symptoms seems to lead to nowhere. Not infrequently such cases will be found to be the victims of early angiosclerosis and will clear up after treatment of this condition and its underlying causes.

AN INSTRUMENT FOR HOLDING A PAIR OF LENSES IN FRONT OF A PATIENT.

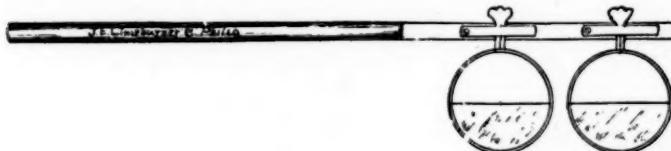
BY JOHN NEELY RHOADS, M.D.,
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I presume it falls to the lot of all oculists to have early presbyopes return after correction and say that they cannot read with their glasses, but at the same time acknowledge that they can see clearly at a distance. I, myself, am doubtful whether presbyopia comes on much before forty-five. To be sure, I occasionally have it proven to me that it does; still, it is always open to a couple of doubts; one, as to whether I have absolutely corrected all errors; and the other, has there been some mistake—however remote and unlikely—in the birth record? Be that as it may, they do come with the complaint that they cannot see to read with their glasses while being able to see distinctly with them at a distance. For such cases I seize the instrument as seen in the cut, which has been reduced one-fourth, and place

a pair of plus lenses in it of any desired strength, and after giving the patient a reading card hold the lenses in front of their prescribed glasses. Now, if they say I can read nicely with that, and I have inserted the full sized lenses, I ask them to look at the card twenty feet away, when to their amazement, of course, they cannot see plainly. It is then that I use the half lenses, as the illustration shows, which, to be sure, will enable them to read at fourteen inches or at twenty feet.

Then, too, a patient may come back after a year a two and say that she can see as well as ever at a distance, but that something has gotten wrong with her glasses so that she cannot thread a needle. This instrument makes it very easy to show the want of new glasses in these cases.

It sometimes happens to operators who have not yet installed the sphero-cylinder trial lenses, that they need to add a fourth



lens in front of their already filled trial frame. With this instrument an extra lens can be temporarily held in front of a filled trial frame with one hand, and with the other a cross-cylinder or other auxiliary instrument can be manipulated in front of it.

In the treatment of myopes, also, this instrument will be appreciated, as it is very convenient to show them that they should use two pair of glasses.

For those operators who still make their examinations without cycloplegia, this instrument will be exceedingly handy, because it will accurately hold a pair of minus or plus lenses so that they can be deftly moved in front of the correction. In fact, for work without cycloplegia I would suggest the use of two of these instruments, one holding a pair of minus and the other holding a pair of plus lenses.

MANDIBLE CAPSULE FORCEPS.*

BY A. E. EWING, M.D.,

ST. LOUIS, MO.

In a recent rectangular keratome extraction of the lens, in which the bread-knife capsule forceps, described in this Journal in the December number, 1912, were employed for the removal of the capsule, it happened that the blades of the forceps were opened somewhat wider than usual and the temporal edge of the lens slipped into the grasp of the right blade. Instead of the blades being closed so as to cut the capsule, they were closed only sufficiently to firmly grasp the lens, and by a little gentle manipulation the lens in its capsule was readily withdrawn. This was followed by a slight presentation of vitreous in the wound without an actual loss. However, as the wound refused to close by about two millimeters, the presenting portion was purposely ruptured and the excess removed by means of a Theobald scissors, which permitted the lips of the wound to become properly approximated. Healing was prompt and the final result was a perfectly clear pupil and normal vision.

This accident has led to the construction of another form of this knife forceps, the blades having somewhat the shape of the mandibles of certain beetles, being curved to one another on the flat in such a way as to leave an open space in the center of the cutting portion, as is shown in Figure 1 A. With this arrangement there is a gain of 1.5 mm. in the width of capsule that will come into the grasp of the forceps. Experience with the instrument is too limited to have fully determined its value, but in the single instance in which it has been used the result has been ideal. With this wider grasp it may often be the means of removing the lens together with its capsule in cases where the zonule is tender and friable and the lens substance in this undivided central space offers sufficient resistance. This would be accomplished without pressure and excessive traction on the globe and without injury to the vitreous. Judging from previous results with this form of forceps, the capsule will assuredly be abscised and withdrawn. However, in about fifty per cent. of these cases, there has been a slight loss of vitreous, possibly due to a division of the capsule too near the margin, or

*Read before the St. Louis Ophthalmological Society, May 26, 1913.

to lack of skill in handling a new instrument. Aside from this, the results indicate that the instrument accomplishes its object very satisfactorily.

In the accompanying diagram, Fig. 1, the cutting edges of the blades and the mode of their approximation is represented at

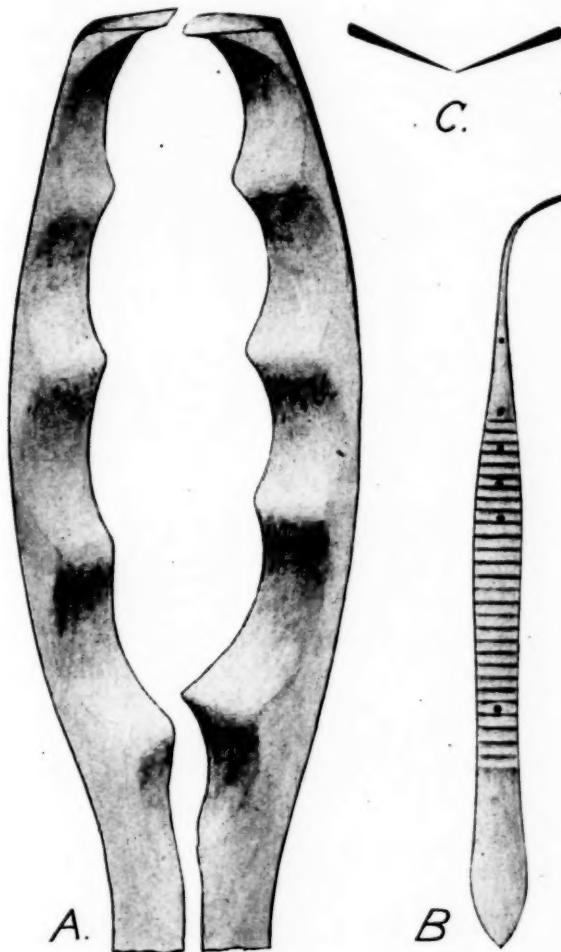


FIG. 1. *Mandible Capsule Forceps.*

A, greatly enlarged, while the actual size of the instrument is shown at B, and at C is given the angle of the cutting edges of the blades one to the other, or the manner in which the edges of the knives set backward. The edges of the blades may be regular, or they may have an undulating bread-knife, or mow-

ing blade serrated form. In the handle there should be guides and stops so arranged that the blades will approximate accurately in order that the small end knives, or teeth, may hang and hold the abscised portion of the capsule. To avoid engaging the posterior surface of the iris, these teeth should be slightly rounded on their anterior corners. Also at the heel the blades should lock without injury to the knives in such a way as to cut the capsule clean; otherwise they will hang the capsule and rupture the vitreous by dragging at the lens margin.

The manipulation of the forceps is the same as with other forms of capsule forceps, the difference in its action being that the sharp blades cut the capsule and effect its removal without injury to its ciliary attachment.

ÆTILOGY OF PHYCTAENULAR CONJUNCTIVITIS AND SUGGESTED TREATMENTS.

Howard F. Pyfer (*Penn. Med. Jour.*, December, 1912) believes that phlyctaenulosis is a manifestation of a general tubercular infection, if not a true tubercular lesion. While this theory is not accepted in any of the modern text-books he has reviewed, yet numerous writers, mostly European, have adopted it and he gives the views of quite a number, and summarizes briefly the results of tests made by many of them which tend to substantiate this theory. The results of his own investigations by the use of the tuberculin test are as follows: "In twenty-two patients, positive; sixteen, seventy-three per cent.; five had some other eye lesion, and one had only a slight reddening that I ruled out as not positive." These were private patients. Of the hospital patients tested, the results were: "In twenty-seven cases, positive in all, 100 per cent.; many of these patients had all the stigmata of tuberculosis." He says in conclusion:

The evidences, the clinical findings, the treatments all show that phlyctaenulosis is a tubercular manifestation of a general tubercular infection. Therefore let us treat the eyes of these little sufferers judiciously, bearing constantly in mind the importance of constitutional measures, emphasizing the use of tuberculin, the necessity of good diet, fresh air, sunshine and ocean breezes.

MEDICAL SOCIETIES

PHILADELPHIA POLYCLINIC OPHTHALMIC SOCIETY.

March 13, 1913.

Dr. Wendell Reber in the Chair.

Retrobulbar Neuritis of Nasal Origin.—Dr. H. Winfield Boehringer.

Dr. Boehringer reported the case of a woman 45 years of age with a family history studded with tuberculosis. Eight years ago in bed 7 weeks with neurasthenia. Two years ago had two post-eclamptic convulsions and for several days vision was misty in both eyes. She was up the 6th day. Four weeks ago patient had mild attack of grippe and was in bed for two days. This was followed in about a week by a bad coryza. A few days later she reported with sudden blindness in her right eye. Vision equalled 20/20 in the left eye and 20/200 in the right. Peripheral vision was better than central. Complained of pain over the right side of her head, especially marked in the right eyeball. Pain in the eye was sharp and severe when percussing over the frontal sinus and more so when the eye was palpated at the outer sclero-corneal junction; but palpation of the eye at any other point elicited no pain. Sudden movement of the eye, especially upward, caused great pain. Pupils were small and reacted to light, and accommodation. The media were clear, fundus details were negative except as to slight tortuosity of the vessels, the veins somewhat dark and full and a slight pallor of the temporal side of both discs. On taking the fields a large central scotoma was found but no concentric contraction of the form or color field.

The nasal mucosa was found engorged with no hypertrophy of the turbinates. Posterior examination and transillumination were negative as to the sinuses. Patient refused an x-ray. Vision varied as follows: First day 20/200, second day 10/200, third day fingers at 1 foot; fourth day fingers at 4 feet; fifth day fingers at 6 feet; sixth day fingers at 12 feet, which I found equalled 20/200. Next day after working hard, vision dropped to fingers at 6 feet. Did not see patient for 3 days and then vision was found to be 20/75. Vision is still intermittent and

foggy and she describes letters as being flashed on and off as by electricity and somewhat luminous. Vision was found to be better on black card than on white one.

The diagnosis of retrobulbar neuritis was made from her sudden blindness following a history of grippe, which in turn was followed by a severe coryza and later oedema of the upper lid, pain in the right side of the head and on percussion over the frontal sinus and on the eye, and severe pain on movement of the eye together with a central scotoma. Hysteria and angioneuritic oedema were excluded. The treatment consisted of spraying the nose with 4 per cent. solution of cocaine and 1/5000 solution of adrenalin four times a day. 10 grains of sodium salicylate were given every 3 hours. Atropine until dryness in the throat and mouth occurred, which in this case was 1/200 grain every hour for 2 days.

Report of a Case of Papillitis of Doubtful Origin.—Dr. Luther C. Peter.

Mr. T., an Italian, age 45, always enjoyed good health until January last, when he suddenly developed severe pain in the right eye in three days. Pain disappeared and patient experienced no other symptoms until middle of February, when pain developed in the left eye. There were no other symptoms, pain having disappeared at time of consultation. Vision in right eye, at this time is limited to faint light perception, and in left eye, 20/30 partly. Pupil of O.D. is moderately dilated, does not respond but feebly to light and accommodation. Consensual contraction is present in the right eye when the left eye is exposed, but not vice versa. Some slight proptosis of O.D., about 2 mm.

Ophthalmic examination at this time, showed in the right eye a round pupil, clear media, disc very hazy in outline, grayish white in color, the cribriform membrane is obscured by exudate, veins are overfilled and tortuous and are lost here and there in retinal haze and oedema. Arteries are much contracted and show considerable perivasculitis, especially on the disc. Marked retinal striation and oedema, which extends some distance beyond the disc edge, but no haemorrhages are visible and above the disc are several small white areas, which probably are the remains of old haemorrhages, there is at this time not much elevation of the disc.

In the left eye the appearance is somewhat in contrast, al-

though similar in some respects. There is more oedema, the veins are more engorged, arteries have not changed so much in calibre though somewhat narrow in size, the disc is not so pale,—evidently earlier stage of the same process described in the right eye.

Ophthalmic diagnosis: papillitis in receding or atrophic stage, in the right eye,—and an earlier, more active stage, in the left. Neurologic examination negative. Nasal examination negative. There is, however, an enlargement of the sella turcica. Wassermann test of the blood was also negative, but no test made from the cerebrospinal fluid.

Treatment consisted of daily hot packs, preceded by pyloearpin hypodermatically, ungu. hydrarg. 1 dr. bd., by skin, and on Dr. Reber's suggestion the nasal passages were packed daily with 25 per cent. argyrol solution for 20 minutes. Since the institution of active treatment, vision has improved from 20/70 to 20/20 partly. Improvement may be due, however, to a recession of the oedema in the left eye, which may or may not have been influenced by the treatment.

Diagnosis in this case is difficult, as the report of both the rhinologist and roentgenologist in this case are negative so far as sinuses are concerned. Systemic disease of the central nervous system can be ruled out because of total absence of corroborative symptoms. Tobacco, alcohol and lead can also be eliminated as aetiological factors. Tumor of the brain, other than syphilitic, has little corroborative evidence.

By exclusion, disease of the pituitary body and syphilis remains to be considered. Against syphilis is the negative Wassermann from the blood test of this patient. However, it is not unusual to find the blood test negative and the cerebro-spinal test positive in late nervous syphilis. In favor of the diagnosis is, first, the initial lesion; second, the tolerance of mercury; third, the improvement under the use of mercury; fourth, the perivasculitis noticeable in the oedema; fifth, the sudden development of the papillitis.

The question of a decompression operation was discussed and Dr. Peter felt that there could not much good come of such an operation at this time.

The Muscular Anomalies of the Eye Due to Sinus Disease.—

Dr. William Campbell Posey.

By reason of the juxtaposition of some of the eye muscles with the walls of the orbit, and the very close association of the

nerves which supply them with the sphenoid cavity, as they pass along the outer wall of this sinus, paresis, and even paralysis of one or more of the eye muscles, may occur as a consequence of sinusitis. While complete paralysis demands an inflammatory process of considerable intensity, and is usually occasioned by a cellulitis of the apex of the orbit secondary to either an active sphenoiditis or ethmoiditis, or more rarely to antral disease, paretic conditions of the muscles may complicate comparatively mild cases of sinusitis, and may occur when the rhinological examination reveals only a congestion of the mucous membrane lining the cavity.

Chronic empyematous conditions of the sinuses rarely occasion marked muscular insufficiencies unless signs of active inflammation arise, for the distention of the walls of the sinus under such conditions is gradual and the displacement of the globe which follows is so slow that the muscles have an opportunity to adjust themselves to the changed conditions of the visual axes under which they are forced to operate. In acute cases, the paresis is occasioned either by direct inflammatory infiltration of the long, broad, flat belly of the muscles themselves, as they lie in association with the walls of the sinus, or by an involvement of the nerves supplying them as they enter the orbit. As in many of these cases the function of the muscle is but slightly interfered with, diplopia is but rarely complained of, and can be detected only by careful search in the periphery field by the aid of a colored glass. Under such circumstances, the diagnosis may often be facilitated by requesting the patient to indicate in which direction movement of the eyes is especially painful, as considerable distress is often excited when the eyes are rotated into the position in which fullest demand is made on the affected muscle.

As a consequence of this paretic condition of the muscles, vision is often blurred, and while, as just stated, many of the palsies are not sufficiently marked to induce diplopia, when the eyes make their ordinary excursions, the imbalance created is sufficient to confuse vision, to cause vertigo, to excite reflex gastric symptoms and to render the near use of the eyes difficult. By reason of their anatomic relationships, paralysis of the levator, of the superior rectus and the superior oblique muscles, serves to indicate a probable involvement of the frontal cells; paralysis of the internal rectus, an involvement of the ethmoidal; and paralysis of the inferior rectus or inferior oblique muscles,

an inflammation of the antral cells. As sphenoiditis may, however, implicate any or all of the nerves supplying these muscles, the value of differentiating the precise muscle affected, as a localizing symptom indicating the involvement of any particular sinus, is not great. Diplopia in the periphery of the field does not always indicate that a muscle has been paralyzed, for it may be induced by a slight displacement of the globe, either by exudation or by the distended wall of a sinus.

Ptosis from paralysis must not be mistaken for drooping of the lid from œdema. This differentiation is not always easy, for, as in all other signs and symptoms of sinusitis, both the œdema and the palsy may be transient and may disappear, only to reappear after several hours of days, or even longer intervals.

I am of the opinion that if many of the cases of palsy of extraocular muscles, attributed to rheumatism were analyzed that an affection of a sinus would be found to be the underlying cause in many instances. Such palsies may appear after "catching cold", and are associated with more or less pain on moving the eye, and possess other characteristics which suggest the presence of an acute sinusitis.

Thrombosis of the Central Retinal Vein Secondary to Nasal Disturbance.—Dr. Wendell Reber.

Dr. Reber reported the case of a colored man who came into the service at the Samaritan Hospital about 4 years ago. Man was about 45 years of age. Had been in perfect health for 25 to 30 years at least. Within two or three days he developed blindness in the right eye, vision being only 20/200. Had been examined by his medical man (who was a relative of his employer) but he could find nothing wrong.

In going over him we found a typical picture of obstructive disease of the central vein; the condition corresponding to that which used to be called apoplexy of the retina. He had some pain in moving the eye but no pain on pressure and no ciliary tenderness and no inhibition of the eye in any of the meridians. Had x-ray made and very careful rhinologic examination. Both negative. The general medical man reported his blood pressure to be 150 systolic and 10 or 15 degrees less diastolic. Practically normal pressure for his time of life. The urinalysis normal and the blood normal, in fact the man was in very good condition. The rhinologic report was doubtful, but I am no longer disturbed by a negative rhinologic report in the diagnosis of nasal disease.

Nasal disease will sweep in and do its damage and disappear by the time the ocular damage becomes apparent. In this man there was a negative Wassermann and von Pirquet. Insisted, however, that the rhinologist follow up the case, and after long rhinologic treatment of 19 to 20 days he regained vision of almost complete retinal picture. There is a slight change in his right optic nerve head, but he still holds on to his 20/30 vision. This was accomplished inside of four weeks without any other treatment whatsoever. I feel that here is a case in which we have shown that the trouble was due to latent sinus disease.

I am perfectly willing to put myself on record as believing that a goodly number of cases of thrombosis of the central veins have in fact been due to latent obscure *un-diagnosed* sinus disease. If there is one thing that to my mind is more important than anything else in the present day study of obstructive disease in the retinal vessels, it is latent obscure nasal disease; but this latent condition need not be purulent. From this fetish we hope the medical world will soon be delivered. It is apt to occur in the eye on the same side as the sinus disease.

Within 8 weeks of the time the above case was seen another colored man presented himself in our same service with thrombosis of the right central vein. The coagulation time of his blood was abnormally short. He ultimately regained vision of 5/9 under long continued small doses of sodium iodid (3 to 5 grs. tid.).

DISCUSSION.

Dr. Posey:—By reason of the intimate association of the optic nerve with the sphenoid bone, and as Onodi has shown, in many cases with the posterior cells of the ethmoid, this nerve is more or less implicated in the majority of active inflammatory conditions of these cavities. Indeed, were it not for the double layer of periosteum which covers the bone forming the barrier between the nerve and the sinus, and for the protection afforded by its sheath, it would be difficult to comprehend how this nerve could escape implication in any affection of the sinus, or the separating layer of bone is frequently as thin as paper and contains many deficiencies.

The involvement of the optic nerve, as a consequence of ethmoidal or sphenoidal sinusitis, may vary in degree from a simple œdema to an active retrobulbar inflammation. While this latter inflammation is rare, even in cases of marked sinusitis, œdema-

tous infiltration is common, although as the change wrought in the nerve is but slight, the symptoms which it excites are not striking, they must be searched for with some care. As a rule, the patient complains of some dimness of vision in one eye, at times of vertigo, headache and other head symptoms. When the ophthalmoscope is employed, the unaffected eye is usually found to be normal, while in the fellow eye a slight veiling of the edges of the nerve is seen, with a dilatation of the retinal veins and a choking of the lymphatics around the central vessels. If the sinusitis is unchecked and retention of the contents of the cavity occurs, the nerve becomes more involved and the familiar signs of a retro-bulbar inflammation of the nerve appear.

In cases of even slight involvement of the optic nerve, the patient is usually conscious of a dimness in the affected eye, although if the vision be tested in the ordinary manner it will be found to be equally good in each eye; in other words, that the vision for form is normal. If the light on the chart be reduced, however, or if Bjerrum's test card is employed, the difference in vision between the two eyes will be at once manifest, and it will be ascertained that the dimness in the affected eye was occasioned by a diminution in the light sense, as a consequence of the oedematous infiltration of the highly organized bundle of fibres which supply the macular region.

The extent of the involvement of the nerve may be further studied by the perimeter, by means of which it will often be possible to differentiate relative central and paracentral scotoma, and at times a concentric contraction of the field. If the congestion of the nerve progresses to inflammation and the conducting power of its fibres is further interfered with, then more positive defects in the visual field will appear, and it will be possible to outline absolute scotoma, both central and paracentral, and peripheral contractions in the field, in accordance with the location and the degree of involvement of the nerve.

Enlargement of the physiologic blind spot has been much dwelt upon by some authorities, as of diagnostic value in such cases; but the facts as to the limits of the normal blind spot are not yet sufficiently defined to make sure any diagnostic conclusions we would like to draw.

Dr. Reber:—I don't think we have had a case here in the last 4 or 5 years that has interested me more than this case of Dr. Peter's.

I don't know whether he was treated for syphilis or not, but

he presents a negative Wassermann. In certain cases of this type a specimen should be taken from the cerebro-spinal fluid. We have also a negative neurologic and rhinologic report in this case. My attitude toward the rhinologic report is that I usually insist that the case be treated on rhinologic grounds, if I think there is any chance of the trouble being due to the sinuses; *and the case generally gets better.* I have come to the belief that only prolonged rhinologic study of these cases is worth while at all. Fuchs' present position is that the rhinologist should be obliged to operate if the ocular symptoms indicate it.

I don't know yet just how much importance the x-ray plays in the diagnosis of these cases for there certainly are variations in size in the normal pituitary body. This man recovered more quickly than I ever saw a syphilitic optic neuritis do. The visual fields are against disease of the pituitary body in this case. There is no denying that we may be dealing with a bizarre syphilitic process.

In Dr. Boehringer's patient the diagnosis rests between hysteria and retrobulbar neuritis. What she tells us about her blindness is absolutely correct. She had some manner of sinus disease, I don't think there is any doubt of that, with the edema of the lid, the history of the case, the grippe, the peculiar type of pain, the tenderness over the frontal sinus and the reduction in vision. If she had had these things without pain it might have been hysteria. I agree with Dr. Posey when he says he wonders we do not oftener see these ocular conditions in connection with nasal disease. I also agree unreservedly with what he has said in regard to the enlargement of the blind spot. I have had cases of optic nerve disease in my office that did not show any enlargement of the blind spot. On the other hand I have secured most valuable information by this method in certain doubtful cases.

The lesson that stands out from these three cases is the necessity of bearing in mind always the possibility of the nasal origin in obscure ocular disease, and the imperative necessity of a skiagraph in all obscure forms of optic nerve disease.

Dr. Peter:—As to enlargement of the blind spot, I have been making a number of experiments and have not been able to satisfy myself that there is any enlargement of the blind spot in these cases unless there is a very marked change in the optic nerve.

I just want to call attention for a moment to Dr. Boehringer's case. It is typical of sinus disease. Central scotoma coming and

going, due to an increased pressure within the sinuses themselves and not an inflammation extending along the vascular sinuses, is suggestive always.

There is a distinct relation between turbinal disease and eye conditions.

DR. D. FORREST HARBRIDGE, Sec'y.

ABSTRACTS FROM MEDICAL LITERATURE.

BY J. F. SHOEMAKER, M.D.,
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TREATMENT OF SCLERITIS WITH TUBERCULIN.

C. N. Spratt (*Journal-Lancet*, June 1, 1912) has treated one case of episcleritis and six cases of keratoscleritis with tuberculin. All of the patients reacted to Koch's old tuberculin in doses of from 1.5 mg. to 10 mg., the lowest febrile reaction being 100.2 F., the highest 102.6 F. A local reaction occurred in six of the cases. Four of the cases were cured in from ten weeks to six months while the other three cases improved under the treatment which was still being continued.

GLAUCOMA, PARTICULARLY IN REGARD TO THE SURGICAL TREATMENT.

John E. Weeks (*Penn. Med. Jour.*, December, 1912) believes that the power of resistance in the eyes of some individuals is lower than normal, so that in simple glaucoma there may be decided cupping of the optic disc in eyes in which the tension is not above normal so far as can be determined. Hence, while tonometers may give very definite information as to the exact tension, yet, from a practical standpoint, the effect increased tension is producing on an eye is better determined by the visual acuity and the changes in the visual fields for form and color than by a tonometer.

Non-operative treatment consists of constitutional and local treatment. The diet should be regulated and any tendency to constipation overcome. As laxative remedies, salines are preferable. If the blood pressure is abnormally high the remedies

generally used should be employed to reduce it. For local use the miotics, pilocarpin and eserin are the main remedies used, and they should be employed in strong enough solutions to keep the pupil very small. Dionin may be used for its anodyne effect, but it often does not affect the tension. Massage of the eyeball applied through the upper lid once or twice daily for about two minutes is of value when properly used in connection with the use of miotics. Operation is recommended, on cases that can be kept under observation, "only when diminution in the field of vision for form or color or in the acuity of vision, or both, take place, or an attack of glaucoma occurs, or there is a distressing element of pain, in spite of the non-operative treatment." The writer believes operative procedure is indicated in cases of glaucoma: (1) when the patient cannot be kept under observation; (2) when the field of vision for form or color diminishes or visual acuity diminishes in spite of non-surgical treatment, as indicated by repeated examinations; (3) when an acute attack occurs in spite of non-surgical treatment; (4) when the element of pain is distressing in spite of non-surgical treatment.

He classifies the direct results obtained by operative procedures for the relief of tension in glaucoma as follows: (1) To remove a portion of the vitreous body or to permit the aqueous to escape; (2) to form a permanent communication between the aqueous chamber and the perichoroidal lymph space; (3) to form a permanent avenue for filtration from the anterior chamber to the exterior of the eyeball, (*a*) by the formation of a cystoid scar with incarceration of the iris or other tissue, (*b*) by the formation of a filtering cicatrix without incarceration; (4) to so influence the secretion into the eye that an excess will not occur; (5) to relieve pain by cutting off the sensory nerve supply to the eyeball.

He places under the first division: (1) Posterior sclerotomy, (2) trephining back of the ciliary zone, (3) sclerociliotomy (Hancock), (4) paracentesis of the anterior chamber, (5) anterior sclerotomy (de Wecker). Under the second: (1) Cycloidalysis (Heine), (2) sclerociliotomy, (3) De Vincentiis' operation, (4) sclerochoriotomy (Querenghi). Under the third: (1) Fistulous cystoid cicatrix, (2) anterior sclerotomy, (3) sclerectomy (Lagrange), (4) filtering cicatrix, (5) trephining (Holth, Major Elliott, Verhoeff, Fergus). To the fourth belong: (1) Section of the cervical sympathetic (Abadie), (2) resection of the superior cervical ganglion of the sympathetic (Jonneesco).

To the fifth: (1) Stretching of the supratrochlear nerve (Bailey), (2) laceration of the infratrochlear nerve (Badal), (3) optic ciliary neurectomy.

After discussing briefly the foregoing operations, Weeks says: "The value of the operations mentioned in this communication appears to the writer to be as follows:

"Posterior sclerotomy and trephining back of the ciliary zone are operations that give good results in sightless, painful eyes in absolute glaucoma, relieving pain and permitting of the retention of the eyeball without danger of subsequent infection or injury of the fellow eye by sympathy. The writer's experience covers seven cases only. The operation was performed in absolute glaucoma for the relief of pain; it was successful in that the pain was relieved. The patients were under observation for various periods from three months to two years. In two of the cases the tension became about T-1, and remained so.

"Sclerociliotomy (Hancock, Walker) and ciliarotomy (Abadie and Querenghi) are operations which have been strongly advocated by their originators. They are operations with which the writer has had no experience. It is, however, very probable that they give temporary relief, at least, and they may be of permanent value in cases of absolute glaucoma. The writer would hesitate to perform the operation of Hancock in any case because of an open wound through the ciliary zone. Operators of experience are unanimously agreed that paracentesis of the anterior chamber is only of very temporary benefit.

"Anterior sclerotomy (de Wecker and Querenghi) belongs to the same category as paracentesis of the anterior chamber, except that the reduction of the tension of the eye is of much longer duration. If these operations alone are employed, the tension returns sooner or later, usually in from two weeks to three months. The greatest value that the operations possess is as a supplement to iridectomy.

"Bjerrum's sclerotomy, since it contemplates incarceration of the iris, is a different proposition. The opening of the sclera is covered by a conjunctival flap and communication between the anterior chamber and the loose subconjunctival tissue is brought about and made permanent, when possible, by subsequent massage of the eye. The incision must, in many cases at least, cause the anterior chamber and the perichoroidal lymph space to communicate by dividing part of the annular ciliary ligament. This operation raises the question of the desirability of inducing and

making permanent incarceration or prolapse of the iris, even subconjunctivally.

"The operations of Rochon-Duvigneaud and de Vincentiis, which contemplate dividing the tissues at the iris angle and making more direct communication between the anterior chamber and Schlemm's canal, must of necessity fail to bring about permanent reduction of the intra-ocular tension in a large percentage of the cases operated upon, although the favorable reports on the results of this operation by Tailer, Sgrossio and others make it appear that a fair percentage of the cases are very materially benefited.

"Cyclodialysis as practiced by Heine is apparently losing favor. The reports of the operators who have practiced this procedure, other than Heine, G. Weinicke, Elschnig and others, indicate that it succeeds in effecting a permanent reduction of tension in approximately fifty per cent. of the cases. A. Knapp writes, 'It can be conservatively stated that cyclodialysis is of value in certain limited conditions; it is indicated in the advanced cases of chronic glaucoma, especially those in which iridectomy has not succeeded in reducing the tension. It cannot in any way replace the classical operation of iridectomy or its recent modifications in incipient glaucoma.'

"The experimental research of Joudine, Wichodzeff and others made on animals demonstrate the fact, in the animals experimented on at least, that the communication between the choroidal space and the anterior chamber is soon closed by a deposition of cicatricial tissue. It is possible that the results of these experiments can be compared only in a limited sense to results in the human eye.

"The operation of Fergus, which differs from that of Heine only in that the opening in the sclera is made by removing a disk 2 to 3 mm. in diameter by means of a trephine, cannot as yet be passed upon, as a sufficiently large number of cases has not been reported. It is evident that its superiority over Heine's operation could result only from a more persistent filtering scar, due to the removal of the disk of sclera.

"Operations that contemplate the incarceration or prolapse of iris, the incarceration of the conjunctiva or other tissue, or the formation of a cystoid scar without adequate covering, as by the conjunctival tissue, are open to the objection that infection may take place at a favorable time days or years after the operation and that sympathetic inflammation may occur. All ophthalmolo-

gists of large experience have observed these complications in such cases and have learned to look upon eyes in this condition as possessing a constant menace to vision. Operations that contemplate prolapse or incarceration with adequate conjunctival covering are objectionable because of necessary distortion of the pupil and, in some cases, deformity at the site of the wound. These eyes are not entirely free from danger of subsequent infection, but infection will be extremely rare and the benefits derived from some of the procedures, as for instance that of Holth, may justify the operator in making the operation. However, if the same result can be obtained by operation not complicated by incarceration or prolapse, the procedure is much more desirable. A protected filtering cicatrix without incarceration or prolapse of the iris or other tissue, with or without iridectomy, is a desirable condition to obtain. The endeavors of Lagrange, Holth, Herbert, Elliott and Verhoeff are in the right direction. The writer's experience has been almost entirely with the Lagrange operation. He has records of eighty-four Lagrange operations.

"The cases were, simple chronic glaucoma, 35; subacute glaucoma, 35; acute glaucoma, 7; absolute glaucoma, 2; secondary glaucoma, 5. Thirty-seven of the patients operated upon (33 private and 4 dispensary cases) have been under observation for periods varying from two weeks to four and a half years. The remainder were dispensary cases and were not kept track of. Vision before operation ranged from zero to 20/20. In the cases of chronic glaucoma, twenty in number, all the patients have retained vision as good or better than before operation except five. Of these, nuclear cataract is developing in two, in three the fields have narrowed slightly and vision is reduced. Of the subacute cases, twelve in number, vision has remained good; nuclear cataract is developing in two. The cases of acute glaucoma, two in number, were cured. There was one case of absolute glaucoma in which the pain was relieved; two cases of secondary glaucoma, tension reduced, so far permanently. The three forms of cicatrix described by Lagrange, namely the smooth cicatrix, the dark line at the site of the sclerectomy, and the cystoid cicatrix, have been observed in my cases. The cystoid cicatrix predominates in the chronic cases. * * * * *

"In acute glaucoma the classical iridectomy with the incision in the iris angle suffices to bring about a permanent desirable result in almost every case. It is well to obtain a subsidence of acute symptoms by the use of laxatives and miotics before the

operation is performed, if possible, and if sclerotomy can be combined with the iridectomy (Lagrange), the good result will be more certainly obtained."

ÆTILOGY AND TREATMENT OF MINERS' NYSTAGMUS.

F. J. Browne and J. R. Mackenzie (*Brit. Med. Jour.*, October 5, 1912), analyzing one hundred cases of this affection, found four important contributing factors in its ætiology. They are: 1, insufficient light; 2, errors of refraction; 3, the straining of the ocular muscles, and 4, the neurotic temperament. Ninety-nine per cent of their cases had been using an inadequate form of light while only one man who used an efficient light suffered with the trouble. Ninety per cent. of their cases had errors of refraction and quite as large a per cent. of the cases were found in men who worked in such positions as threw severe strains on the ocular muscles.

INFLUENCES OF DIONIN UPON PUPILS AND TENSION OF NORMAL EYES.

Franz Toczyński (*Zeitschrift für Augenheilkunde*, July, 1912) finds that dionin first causes a contraction of the pupil, to a greater or less degree, according to the amount of chemosis produced, there appearing to be a definite relationship between the two. This contraction of the pupil lasts a longer or shorter time and is followed by a dilatation, the duration of which seems to have no close connection with that of the miosis. The intraocular tension rises after the use of dionin until it reaches a certain height and then falls, sometimes below normal. While as a rule the tension is increased during the time the pupil is contracted, it varies during the period of dilatation, sometimes being increased and other times going below normal.

RELATIONS BETWEEN PERLECHE AND BLEPHAROCONJUNCTIVITIS CAUSED BY DIPLOBACILLI.

S. Ishihara (*Klinische Monats. für Aug.*, October, 1912) says that perlèche, an eczematous inflammation of the corners of the mouth, caused by the Morax-Axenfeld diplobacillus, is quite common, at least in Japan. As the diplobacilli can readily be transferred from the mouth to the eye where they may set up a typical blepharоconjunctivitis, the importance of curing the perlèche for the prevention of the conjunctivitis is apparent.